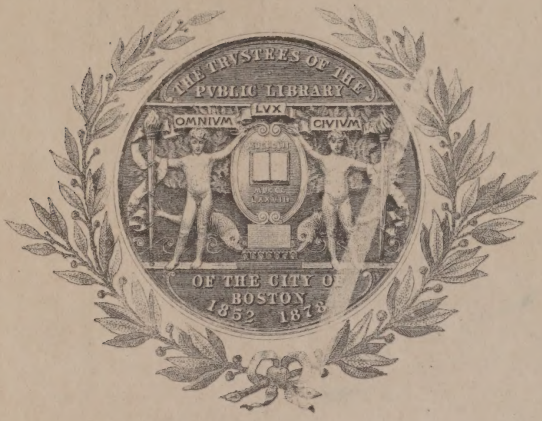
BOSTON PUBLIC LIBRARY
3 9999 08657 260 7

№ 7869.105


THE TRVSTEES OF THE
PVBLIC LIBRARY
OMNIVM
LVX
CIVIVM
OF THE CITY O
BOSTON
1852 1878

JAN

7869.105
From 4405.64
217.271
June 4, 1877.

NOTICES OF NEW LOCALITIES OF RARE MINERALS, AND REASONS FOR UNITING SEVERAL SUPPOSED DISTINCT SPECIES. By Francis Alger, Member of the Boston Society of Natural History, of the American Academy of Arts and Sciences, &c.[1] (Read before the Boston Society of Natural History, January 7th, 1846.)

Phacolite *from New York.* This rare mineral, which comes to us principally from Bohemia and Ireland, I have discovered among a suite of specimens of various kinds found on New York Island, near Harlem, by Messrs. Mathews and Johnson, of New York city. The specimens, which eventually proved to be this mineral, were labelled Stilbite; but their appearance was so peculiar, that I questioned at the time whether they had been correctly designated, and determined to examine them carefully at my earliest convenience. I have since received two other specimens, better characterized than the first, from Mr. Johnson. The crystals are in a geode form, implanted on calcareous spar, and associated with silver-colored mica and a few scales of Oligisto-magnetic iron ore. They are

[1] From the Journal of the Boston Society of Natural History.

of a wax or honey-yellow color, have a waxy lustre, and the smallest individuals are translucent. They are brittle, breaking with an uneven fracture, have none of the foliated structure of Stilbite, and afford no indications of cleavage. Hardness superior to that of Stilbite, and equal to that of Chabasite. Their surfaces are roughened or pitted, so as to reflect no image by which they could be subjected to measurement by the goniometer. Before the blowpipe, a fragment of the mineral swells and intumesces slightly, like the Bohemian and Ferroe Chabasite, and fuses into an opaline, blebby bead; at the moment of ignition, in the outer flame, it gives out a beautiful green phosphorescence, which I have also noticed, in a less degree, in the Phacolite from Ireland. It is soluble in hydrochloric acid. The crystals, at first sight, appear to be rounded, and to have no determinate form; but, on closer examination, some of the smaller and more isolated ones are found to be nearly perfect double six-sided pyramids, precisely similar to the Phacolite from Bohemia, differing from it only in color and lustre. I cannot doubt that, like that mineral, they are secondaries to a primary rhombohedron, probably of the same measurements, and are also identical with it in composition. The absence of well defined cleavage is unfortunate, but this is a defect which applies equally to the foreign mineral. Nor is the rhombohedral cleavage of ordinary Chabasite, of which Phacolite is by many supposed to be only a variety, by any means easily determined; in fact, Sir David Brewster has suggested, from optical investigations, whether the primary form of Chabasite be not a prism.

Is Phacolite a variety of Chabasite, or distinct from it? Tamnau, of Berlin, in his very complete little essay on Chabasites, has given very good reasons for uniting the two; while Breithaupt has maintained them to be distinct. The primary rhombohedron of Phacolite, according to Breithaupt, is P on P, 94°, that of Chabasite P on P, 94° 24′. Phillips makes the last 94° 46′. The analyses of Anderson and Rammelsberg would seem, at first, to show a marked difference in their

composition, a difference which is also shown by the different analyses of common Chabasite, resulting in varieties having different formularic expressions. For example, Acadiolite contains three per cent. more of silicic acid than common Chabasite, and is a tersilicate of lime and the other isomorphous bases, instead of a bisilicate of the same bases. The mineralogical formula of Acadiolite is, $3\,Al\,Si^2 + (Cal, N, K,)\,Si^3 + 6$ Aq., while that of Chabasite is, $3\,Al\,Si^2 + (Cal, N, K,)\,Si^2 + 6$ Aq. Rammelsberg is inclined to regard Phacolite as a mixture of Acadiolite and Scolecite (lime mesotype,) the latter containing an additional atom of water.[1] By uniting the atoms of both, he thus states the chemical formula for Phacolite: $2\,\dot{R}\,\ddot{S}i + \ddot{A}l^2\,\ddot{S}i^3 + 10\,\dot{H}$. As the analyses stand, (compare Berzelius's and Thomson's with the two just referred to,) Phacolite differs from Chabasite in containing three per cent. less of silicic acid, and three atoms less of water. Now it is obvious that these differences are insufficient to authorize a separation of the two minerals, unless there be a want of agreement in crystallographical and other characters, greater than that as yet pointed out. An equally valid reason could be urged for the separation of Acadiolite from Chabasite, on the ground of a difference in their composition, had not the examinations of Prof. G. Rose proved an exact agreement in the angles of their primary crystals. So, also, of Levyne and Gmelinite, which are now admitted to be only varieties of Chabasite, their occurring forms all being secondaries to the same primary rhombohedron. The evidence of the identity of any two minerals is best shown by the incipient or intermediate passages of one into the other, in the same specimen. I am not aware that, in the case of the Irish or Bohemian Phacolite, such evidence has been adduced; no tendency of the sort is shown in the specimens I have examined, from those

[1] See First Suppl. to his *Handwörterbuch*, p. 112. It was on these grounds that Hoffman proposed to separate Acadiolite, as well as the Gustafsberg variety, from Chabasite. — *Poggendorf's Annalen*, xxv. 495.

countries. Now one of my specimens, from New York, has the distinct form of Chabasite (the perfect rhombohedron,) and of Phacolite (perfect double six-sided pyramids.) The first form, however, is rare; the incipient replacements are also shown; but these crystals have not the full perfection of waxy lustre reflected by the ultimate form of Phacolite,—a singular effect, attributable, probably, to the nature of the solvent in which the molecules were suspended.

Approach of twin-crystals to the Phacolite form. These, as they are sometimes presented, would, unless carefully examined, be mistaken for the true form of Phacolite. The most perfect specimens I have seen, are from Nova Scotia. They consist of two rhombohedrons united in the usual manner, each crystal turned half round, but having their superior edges and lateral angles deeply replaced. The approach to the form of Phacolite is thus produced: the edges and angles not standing out in relief, as they ordinarily do in these twin forms. The striæ, parallel with the edges of the two rhombohedrons, so intersect as to show the compound nature of the crystals. Dr. C. T. Jackson has a fine specimen of this variety from the Two Islands, in Nova Scotia, of a wine-yellow color; I have another pure white, from the same place.

Yttro-cerite. This rare mineral is found, associated with Brucite, in rolled masses of limestone, in the town of Amity, Orange county, New York. I have, as yet, seen but two specimens of it, which I found among some fragments of limestone containing Brucite and mica, in the duplicate collections belonging to the late Dr. Horton, of Edenville. It attracted my attention as being unlike fluor spar, which it was supposed to be at the time, and I have now satisfied myself that it is Yttro-cerite, though I have not gone so far as to detect the Yttria, the presence of which in the mineral cannot be indicated by mere blowpipe experiments alone. It has no crystalline structure, but appears in thin layers, or seams, which sometimes amount to scarcely anything more than

peach-blossom, or purple stains, penetrating the seams of the limestone: precisely the character of this mineral in the specimens I have of it, from Finbo, in Sweden. With this it also agrees in hardness and color. When heated in a glass tube, it slightly decrepitates, shows no phosphorescence, gives out moisture, and becomes milk-white; at the same time, there is a perceptible burnt smell. When its powder, moistened with sulphuric acid, is placed in a platinum crucible, hydro-fluoric acid is given out by the application of heat, and the usual reaction on glass is produced. The pulverized mineral, heated with fused salt of phosphorus in an open glass tube, also shows the same reaction, the glass losing its polish where the moisture is deposited. In these experiments I was careful to separate the mineral entirely from the Brucite; but I have not been able to obtain fragments sufficiently free from carbonate of lime, to enable me to give its blowpipe characters in detail, or subject it to any other trials. I hope to be able to obtain better specimens at an early day, and then to complete its examination. The mineral is very characteristic, and, in the hand specimen, cannot be distinguished from the Finbo variety.

Ottrelite identical with Phyllite. The name of Phyllite, from φυλλον, a leaf, was given by Dr. Thomson to a mineral, which was discovered and sent to him for analysis by Prof. Nuttall. It comes from Sterling, Massachusetts, and is disseminated, in small, thin plates, through what appears to be an argillo-micaceous slate. Some of these plates are angular and others rounded, not appearing to have any regular crystalline form; yet, in a few instances, they present the distinct form of rhomboidal tables. Color, brownish-black, or grayish-black; lustre, shining and semi-metallic; opake; fracture, uneven. The knife makes a faint impression upon them. In strong transmitted light, the thinnest disks present a greenish color. Before the blowpipe, on charcoal, it becomes magnetic, but does not fuse even on the edges; with double its bulk of

borax, it slowly dissolves into a dark iron-green glass. Its composition, as stated by Dr. Thomson, is as follows:

Silica,	38.40
Alumina,	23.68
Peroxide of iron,	17.52
Magnesia,	8.96
Potash,	6.80
Water,	4.80
	100.16.

Ottrelite was discovered by M. Desclozeaux, and analyzed by M. Damour, in 1842. A full description of it is given in the *Annales des Mines*, for that year, vol. ii. p. 357. It occurs in small disks or plates, of a grayish-black or greenish-black color, with considerable metallic lustre, disseminated through a gangue which appears like a greenish argillaceous slate. These disks present no distinct form in the specimens I have examined, their edges being rounded, as in the case of the Phyllite; but Desclozeaux has referred them to a hexagonal prism, or to an acute rhomboid deeply truncated by a plane perpendicular to the axis, or deeply compressed in that direction. He also obtained a cleavage parallel with that plane. Minute fragments are translucent, and show a greenish color by transmitted light. Before the blowpipe, it fuses, alone, with difficulty, *on the edges*, into a black, magnetic globule. It dissolves slowly in borax, giving the reaction of iron, and with carbonate of soda, shows the presence of manganese.

Its constituents are as follow:

		Oxygen.	Ratio.	Formulæ.
Silica,	43.34	22.51	4	
Alumina,	24.63	11.50	2	$2\,\mathrm{Al}\,\mathrm{Si} + (\underline{\mathrm{Fe}}, \underline{\mathrm{Mn}}.)\,\mathrm{Si}^2$
Protox. of iron,	16.72	3.80	5.63	$+\,\mathrm{Aq}.$
Protox. of manganese,	8.18	1.83	1	
Water,	5.66	5.03	1	$2\,\dddot{\mathrm{Al}}\,\dddot{\mathrm{Si}} + (\dot{\mathrm{Fe}}, \dot{\mathrm{Mn}}^3.)\,\dddot{\mathrm{Si}}^2$
	98.53			$+\,3\,\dot{\mathrm{H}}$

Dr. Thomson's analysis affords a different formula, and, ac-

cording to his method of determining the atomic proportions, Phyllite is a simple silicate, (the atoms of silica and bases being equal,) consisting of nine atoms silicate of alumina, three atoms silicate of peroxide of iron, three atoms silicate of manganese, and one atom silicate of potash.[1] The occurrence of so large a proportion of potash in the mineral is not a little remarkable, and I would suggest whether it may not have been derived from the gangue of slate, from which it is difficult to obtain the mineral entirely free. Its infusibility before the blowpipe would seem to show this. It has been suggested, also, that a part of the iron may have been in the state of protoxide. It seems impossible, without some such supposition, that substances, so closely resembling each other in all their physical characters, should differ so much in chemical composition. Now, if the potash be left out, and the peroxide of iron be changed into protoxide, the ratio between the atoms of acid and bases is nearly the same as in Ottrelite, if we unite the atoms of magnesia and iron, as isomorphous with each other. Ottrelite, also, is not easily separated from its matrix, but the larger size of its plates would seem to render it more easy to obtain pure specimens for analysis; and it is to be observed that Damour repeated his analysis, and obtained precisely the same result. It is remarkable that Rammelsberg has alphabetically inserted Phyllite, but has given no formula for its constitution. It seems proper that the name of Phyllite, on the ground of its priority, and because it expresses so well the ordinary appearance of the mineral, should stand, and that of Ottrelite be abandoned.[2]

Dysluite identical with Automalite. I am satisfied, from recent observations, that these two minerals, as they occur in New Jersey, should form but one species. The difference in

[1] Outlines of Mineralogy, &c., vol. i. p. 384. Dr. Thomson's atomic weights, founded upon the idea of Prout, that they are all multiples of the atomic weight of hydrogen, vary somewhat from Berzelius's.

[2] Brooke has supposed Phyllite to be identical with Gigantolite. If we compare the analysis of Gigantolite with Damour's analysis above, the evidence of their identity (supposing Ottrelite to be a purer variety of Phyllite) is much more marked, and the ratio between the atoms of acid and bases is nearly the same in each.

hardness, color, specific gravity and pyrognostic characters, can be accounted for by the well established fact of the isomorphous replacement among the constituents of certain minerals which do not differ in crystalline form. In Dysluite, we have but thirty per cent. of alumina, the acting acid principle in the mineral, while, in Automalite, we have sixty per cent. But the peroxide of iron, which is isomorphous with the alumina, amounts to nearly forty-two per cent. Now, if we suppose about thirty per cent., of this peroxide of iron, to have replaced the same number of atoms of alumina in Automalite, and the eight per cent. of protoxide of manganese to have replaced so much of the oxide of zinc, we make up, very nearly, the essential constituents as shown in the analyses of Automalite by Ekeberg and Abich. It is to be observed that the latter chemist puts down the iron as *protoxide* in the Franklin Automalite. If it should prove that the iron exists in Dysluite in both states of oxidation, the twelve per cent., remaining out of the forty-two, may be protoxide, replacing so much oxide of zinc. So that, in this view of the case, the 17 per cent. oxide of zinc + 11 per cent. protoxide of iron + 7 per cent. protoxide of manganese = 35 per cent. oxide of zinc, which is nearly the exact quantity found by Abich in the crystals from Franklin. We may then state the constituents as follow :

		Oxygen.		Ratio.
Alumina,	30.49	14.24	23.43	3
Peroxide of iron,	30.00	9.19		
Protoxide of iron,	11.93	2.72	7.76	1
Protoxide of manganese,	7.60	1.70		
Oxide of zinc,	16.80	3.34		

Here it is evident that the atoms of acid and bases are to each other as three to one, which is the case, also, with Automalite, taking Abich's analysis, and grouping the isomorphous bases, thus :

		Oxygen.		Ratio.
Alumina,	57.09	26.66		3
Oxide of zinc,	34.80	6.92	8.72	1
Magnesia,	2.22	.76		
Protoxide of iron,	4.55	1.04		

Dr. Thomson, the only chemist who has analyzed Dysluite, reckons all the iron as peroxide, and as the principal basic constituent of the mineral, which, in his view, consists of the aluminates of iron, zinc and manganese. Rammelsberg, in stating the analysis, has given both oxides, and the atoms of alumina and peroxide of iron, as put down by him, are 22.80, and those of the isomorphous bases — protoxide of iron, protoxide of manganese and oxide of zinc — are 7.83 (7.89 ?); thus giving the same ratio as that above stated.

But other reasons may be urged why Dysluite should be regarded only as a variety of Automalite. I have seen specimens on which there were crystals well claiming the name of Dysluite, as well as others equally entitled to the name of Automalite; while there were yet others, evidently passing from one into the other, — the bright and perfect crystals of Automalite gradually losing their lustre, becoming porous, comparatively brittle and soft. I think if these circumstances had been attended to in the early history of the mineral, the name Dysluite would long since have departed from the catalogue of mineral species.

Polyadelphite. As Dana, in the new edition of his mineralogy, has very properly included this mineral under the species garnet, I merely refer to it, to give further evidence of the correctness of his opinion from circumstances connected with its occurrence at the locality. It is evidently a granular, imperfectly crystallized yellow garnet, and the specimen which I received, ten years ago, from Prof. Nuttall, contains mechanical mixtures which it would be impossible to separate from it, so as to give us entire confidence in its analysis. To these, I believe, we may attribute its departure in composition from the common brown or yellow garnet, though it does not differ much from the brown garnet of Franklin, analyzed both by Dr. Thomson and Mr. Seybert.

Beaumontite of Levy, and *Lincolnite* of Hitchcock. In a paper read before the Boston Society of Natural History, and since published in their Transactions, and in the American

Journal of Science, (vol. xlvi. p. 235,) I gave my reasons for classing these two minerals with Heulandite. That Beaumontite is Heulandite, I believe, is no longer doubted in this country or Europe. An analysis of the mineral, by M. Delesse, has appeared since the publication of my paper,[1] and it agrees with all the other analyses of Heulandite, excepting in the slight excess of silicic acid. In this respect, it offers an example analogous to that of the variety of Chabasite called Acadiolite, in which the silicic acid forms a larger atomic proportion of the mineral, without causing any appreciable variation in the angles of the crystals. As to Lincolnite, I must think that the various papers, that have been called forth in relation to it since my first communication appeared, have established its indisputable identity with Heulandite.

Peculiarities in the modifying planes,[2] have given rise to a secondary form, rarely observed in Heulandite. These consist in the enlargement of the planes *f* (Phillips,) or *ĕ* (Dana,) so as nearly to obliterate the primary planes *M*; being, in fact, the reverse of what we usually observe in Heulandite from other localities. In the measurements by Prof. Hitchcock and Prof. Shepard, the angle of *f* on *T* was mistaken for that of *M* on *T*, and in the figure given by Prof. Hitchcock, it is evident that the planes lettered *M* should be *f*. The true value of *f* on *T* is 115° 10′ (Dana); Prof. Shepard's last measurements made it 116° 17′.

Ledererite. I am compelled, at last, to declare my conviction that the specific nature of this mineral can no longer be maintained. Connell's analysis of an Irish Gmelinite, which agrees with Ledererite in all its physical and crystallographical characters, has shown also an identity in chemical composition. The phosphoric acid, detected by Mr. Hayes, must be viewed as an accidental constituent, varying probably in different

[1] *Ann. de Chim. et de Phys.* for 1843, t. ix. p. 395. Phillips's Min. p. 627.

[2] For the figures see Am. Jour. of Science. vol. xlvi. p. 234, and vol. xlvii. p. 416. Corroborative evidence of the correctness of my opinions, by the editors of the Am. Jour. of Science, may be seen at the pages here referred to.

crystals, or, in some of them, not existing at all. Some of the Zeolites, in the Nova Scotia trap, have been found associated with small crystals of phosphate of lime, and it is not impossible that some of the minutest of these may have intercrystallized with the Ledererite. We regret that we have not been able to obtain other specimens to enable Mr. Hayes to give it a reëxamination. For comparison, I subjoin the analyses of Ledererite and Gmelinite.

	Ledererite.		Gmelinite.
Silica,	49.47		48.56
Alumina,	21.48		18.05
Lime,	11.48		6.13
Soda,	3.94		3.85
Phosphoric acid,	3.48	Potash,	0.39
Protoxide of iron,	0.14		0.11
Water,	8.58		21.66
	98.56, Hayes.		98.75, Connell.

Now, if the phosphoric acid, in Ledererite, is united with lime as an accidental mixture, $2\frac{1}{2}$ per cent. of the lime should be taken from the 11.48 per cent found in the mineral: this brings the proportion down nearly to that obtained by Connell. Mr. Hayes was not able to determine the weight of the water with accuracy, owing to the small quantity of the mineral operated upon. As the loss (1.44 per cent.) was mostly water, we may suppose, with Rammelsberg, that Ledererite is Gmelinite containing $\frac{1}{3}$ ($\frac{1}{2}$?) its quantity of water. The chemical formula for Gmelinite and Chabasite is thus:

$$(\dot{Ca}, \dot{Na}, \dot{K}^3)\ \ddot{Si}^2 + 3\,\dddot{Al}\,\dddot{Si}^2 + 18\,\dot{H}.$$ [1]

Excepting the absence of striæ, and the shorter dimensions of the prismatic planes of its crystals, the Irish Gmelinite precisely

[1] *Handwörterbuch*, i. 150. Rammelsberg unites Chabasite and Gmelinite, the first as soda Chabasite, the last as lime Chabasite. This is in accordance with Tamnau, who has established their identity on crystallographical grounds. The close relation of the two minerals was, however, first shown by Prof. Mohs. See his Mineralogy, vol. ii. p. 105.

resembles Ledererite; their hardness, lustre, color and blowpipe characters are the same. The appearance of hexahedral cleavage, on which Dr. Jackson originally founded the chief claim of the latter to the character of a new species, was only imperfectly produced by heating the crystals, and not by ordinary mechanical cleavage. This could not be effected, the mineral breaking, in all directions, with a vitreous fracture. Dr. Jackson agrees, with me, that it can no longer be retained as a distinct species.

While preparing my edition of Phillips's Mineralogy, I requested Mr. Hayes and Dr. Jackson to make several analyses for me with particular reference to that work. As some of these have not appeared in any other form, I wish now to make a permanent record of them, in order that they may be seen where they might not otherwise reach. The first are of the Nova Scotia Chabasite (Acadiolite,) which Hoffmann has distinguished from common Chabasite, by its containing 3 per cent. more silica, and for which Rammelsberg has given a formula differing somewhat from that of Chabasite. (See first part of this article.)

Silica,	52.02	52.20
Alumina,	17.88	18.27
Lime,	4.24	6.58
Potash,	3.03	2.12
Soda,	4.07	
Water,	18.30	20.52
	99.60, Hayes.	99.69, Hayes.

These results agree with those obtained by Hoffmann,[1] in his analysis of the same mineral, the specimens of which were presented to him by Charles Cramer, Esq., of St. Petersburg.

Washingtonite of Shepard, analyzed by Mr. J. S. Kendall, under the direction of Dr. Jackson, gave these results:

[1] Amer. Jour. of Sc. vol. xxx. p. 366.

		Oxygen.	Ratio.
Titanic acid,	25.28	4.82	1
Peroxide of iron,	51.84	10.36	2
Protoxide of iron,	22.86	5.08	1
	99.98		

The atomic proportions are thus, nearly one atom titanic acid, two atoms peroxide of iron, one atom protoxide of iron; or, a trititaniate of iron, consisting of two atoms trititaniated peroxide and one atom trititaniated protoxide. If we unite the magnesia and lime with protoxide of iron, in the following analysis of an Ilmenite from Arendal,[1] by Mosander, we obtain precisely the same result. The crystalline form of the two varieties is also the same, and there can be no donbt of their identity as one species.[2]

Titanic acid,		24.19
Peroxide of iron,		53.01
Protoxide of iron,	19.91	20.92
Magnesia and Lime,	1.01	

By referring to the analyses of Ilmenite from other localities, it will be seen that the essential constituents, titanic acid and the two oxides of iron, so interchange with each as to produce different varieties, but all having the same crystalline form.

[1] The Hystatite of Breithaupt.

[2] An acute rhombohedron, P on P 86° 10′, for the Ilmenite. Shepard, employing varnished planes of the Washingtonite, makes P on P 86°. Prof. Shepard founds the distinction on other than crystallographical characters; for, he says, it is not thus "shown to be distinct, in any essential manner, from the axotomous iron-ore of Mohs, or from Crichtonite (including Ilmenite): indeed, it appears most probable that all these minerals are not only identical in their angles, but are isomorphous with specular iron." Am. Jour. vol. xliii. p. 365. The analysis, now, would seem to destroy the groundwork for any distinction.

Boston Public Library
Central Library, Copley Square

Division of
Reference and Research Services

The Date Due Card in the pocket indicates the date on or before which this book should be returned to the Library.

Please do not remove cards from this pocket.